ATTACHMENT E.1

RECYCLED URANIUM CHRONOLOGY

TABLE E.1-1

CHRONOLOGY OF ENRICHED URANIUM RECYCLE BASED ON SEARCH OF ARCHIVED RECORDS

Date	Explanation	Reference
8/12/57 thru 12/6/60	Examples of "300 " Type Uranium	Production Orders D-46, E-20, D-315, D-317, D-326, D-335, and D-412
1/3/58	Temporary Operating Procedure for Moving of 1.7 percent (or less) U235 Enriched Washers or Washer Stock Between Plants 9 and 6.	Temporary Operating Procedure Specification No. TE-9C-100-6
3/25/58	Temporary Operating Procedure for Storage and Movement Of Uranium Material of U235 Enrichment Up To 5 percent Within and Around The Plant 1 Enriched Material Warehouse.	Temporary Operating Procedure Specification No. TE-1C-400-1 Revision of NLCO-609 (Rev.2)
6/30/58	Temporary Operating Procedure for Storage and Movement Of Enriched Uranium and "U" Bearing Materials (1 percent U235 Max) at Plant 9.	Temporary Operating Procedure Specification No. TE-9C-400-6
4/14/60	Temporary Operating Procedure Storing Rods, Slugs, Black Oxide, Sump Cake in Building 67.	Temporary Operating Procedure Specification No. TE-1C-400.2
2/15/61	First recycle uranium (500 material) from 100 percent 6-4 material.	Conversion To "500" Production Plant 9
3/3/61	PO-A-500 6-4 UF_4 Product for PO-A500 Started on 2/13/61.	Pilot Plant Monthly Production Report – February.
6/14/61	Produce normal uranium UO_3 utilizing concentrates, recycle and residues (normal uranium).	Production Order A-402, Rev.1 Operation of the Refinery (Plants 2 and 3).
1/1/62 - 1/31/62	Plant-Scale Tests of Oxidation-Reduction Activation Of Continuous-Pot UO_3	NLCO-850 Summary Technical Report
1/23/62	Processing Of 0.94 Recycle Material	Production Order A500-Rev.1
4/10/62	Conversion of Hanford tails to high quality green salt by the reduction-oxidation activation step in Plant 4.	Production Order A508 Reduction-Oxidation Activation of Hanford UO_3 In Plant 4
6/27/62	Uranium to be recycled 0.94 percent U235 Material	Production Order AA-510 Enriched Recycle Uranium Ingots - HAPO.
7/17/62	Produce UF_4 from UF_6 for Sweetener Stock for Enriched Isotopic Blending.	Production Order A-511 Operation of Pilot Plant Hexafluoride Reduction Unit
9/6/62	Sweetener UF_4 from 6-to-4 UF_4 Production Order A-511.	Pilot Plant Monthly Production Report August, 1962
4/16/63	Plant 9 Isotopic Dry-Blending Reduction Data Summary-Initial Production.	Letter D.C. Bonfer to E.W. Mautz, Plant 9 Dry Isotopic Blending Progress-Isotopic Data for Period 8/16/62 to 4/1/63.

TABLE E.1-1 (Continued)

Date	Explanation	Reference
4/18/63	Supply MCW with 0.947 enriched slag liner "500 Series"	Production Order E-437 0.947 Enriched Slag Liner to MCW for Mark VE Production.
7/8/63	Operation of the supplemental recovery facility, consisting of (a) Metal Dissolver and (b) Digestion System located in the FMPC Refinery. Details of operation were outlined in May 13, 1963 Residue Meeting held at the FMPC.	Production Order A-761 Supplemental Recovery Facility
11/5/63	Furnish Weldon Spring with 4300 pounds of 1.47 percent U235, 6 to 4 UF_4.	Production Order AA-787 1.47 percent Green Salt for Weldon Spring.
6/11/64	Ship slightly enriched residues to Weldon Spring	Production Order E-447 Enriched Uranium Residues to MCW.
10/30/64	Convert UO_3 received from Savannah River (enriched reactor tails) to UF_4.	Production Order A-526 Conversion of SRP UO_3 to UF_4 in Plant 4
1/5/65	Produce UF_4 from UF_6 for sweetener stock for enriched isotopic blending. Reflects change in isotopic level of sweetener mentioned in Dec. 23, 1964 enriched operating schedule.	Production Order A-529 Operation of Pilot Plant Hexafluoride reduction unit.
1/1/65	Purposes of SERF campaign.	NLCO-961 Special SERF COMPREHENSIVE REPORTS Jan.-June, 1965
7/30/65	Operation of the supplemental recovery on 0.94 percent U235 residues.	Production Order A-887 Supplemental Enriched Recovery Facility (SERF)
7/30/65	Operation of the supplemental enriched Recovery facility on special isotopic runs of non-routine residues equal to or less than 5.0 percent U235.	Production Order A-888 Supplemental Enriched Recovery Facility (SERF)
2/16/66	Ship 0.86 percent materials to Weldon Spring 10 tons UO_3, 10 tons UF_4, & 10 tons U	Production Order E-457 Shipment of 0.86 percent U235
10/1/66	Conclusions for SERF Operations in Refinery.	NALCO-961 (Suppl. 2) Special SERF Operations Report.
2/2/67	Operation of the supplemental enriched recovery facility on special isotopic runs of non-routine residues equal to or less than 5.0 percent U235.	Production Order A-960 Supplemental Enriched Recovery Facility (SERF)
2/8/66 thru 6/14/68	Production of 2.1 percent U235 Enriched NOE Billets and Fuel Cores.	Production Orders A-979 AA-927, AA-975, AA-979, AA-980, and H-011
3/27/67	Recovery of Np237 from Nuclear Fuel Services (NFS) Uranyl Nitrate Product.	Letter, J.H. Noyes to C.L. Karl

TABLE E.1-1 (Continued)

Date	Explanation	Reference
8/8/67	Residence Time Within FMPC For Recycle Uranium.	Residence Time Report
10/5/67	Richland Neptunium Production, Han-98008	Letter: C.L. Karl to J.H. Noyes
10/10/67	Produce High U^{236} UO_3 and UF_4 Using NFS Yankee Material.	Production Order AA-977 High U-236 Orange Oxide and Green Salt (1.25 percent U^{235})
10/27/67	Operation of the FMPC Refinery including all digestion processes, e.g. metal dissolver, slag leach, etc. on multi-assay campaigns.	Production Order A-978 Refinery
11/30/67	Enriched 0.86 percent U^{235} Campaign.	Letter: L.H. Harmon to S.F. Audia, Refinery Campaign For December, 1967
1/15/68	High U^{236} Yankee Campaign	Letter: L.M. Levy to S.F. Audia High U^{236} Yankee Campaign.
3/6/68	Produce orange oxide in the Refinery and green salt in Plant 4 at the isotopic content of 0.75 percent.	Production Order H-001 Production of 0.75 percent U^{235} Orange Oxide and Green Salt.
3/6/68	Produce orange oxide in the Refinery and green salt in Plant 4 at the isotopic content of 1.06 percent.	Production Order H-003 Production of 1.06 percent U^{235} Orange Oxide and Green Salt.
3/6/68	Produce orange oxide in the Refinery and green salt in Plant 4 at the isotopic content of 0.91 percent.	Production Order H-002 Production of 0.91 percent U^{235} Orange Oxide and Green Salt
4/8/68	Conversion of Hanford tails (0.98 percent) to high quality green salt by the reduction – oxidation activation step in Plant 4.	Production Order A-999 Reduction-Oxidation Activation of Hanford UO_3 in Plant 4 (0.98 percent)
8/13/68 thru 1/27/71	(3.85 percent) Enriched Uranium Billets for ORNL Criticality Study	Production Order H-017, H-042, H-052 and W-002
4/7/69	2 percent U_{235} Campaign in Refinery	Letter: F.C. Tritschler to N.R. Leist, Recommended Operation of the Refinery Digestion Area during the 2 percent U^{235} Campaign
4/21/69	Extraction of 2.0 percent U^{235} Uranyl Nitrate.	Letter: D.L. Dunaway to W.J. Adams
4/30/69	Refinery 2.0 percent Campaign in Denitration.	Letter: M.S. Nelson to R.F. Bravard, A.B. Kreuzmann, W.E. Palmer
5/8/69	Produce Orange Oxide in the Refinery And Green Salt in Plant 4 at an Isotopic Content of Approximately 2.0 percent	Production Order H-029, Rev.1 Production Of 2.0 percent U^{235} Orange Oxide and Green Salt.

TABLE E.1-1 (Continued)

Date	Explanation	Reference
8/8/69	Process through reduction less than normal assay UO_3 received from SRP for the PNUR program.	Production Order H-044 Utilization of SRP Recycle in PNUR Program.
8/8/69	Process through reduction greater than normal assay UO_3 received from SRP for the PNUR program.	Production Order H-045 Utilization of SRP Recycle in PNUR Program.
2/26/70	Convert Hanford Tails from their normal uranium processing to green salt in Plant 4 for use in PNUR Program.	Production Order H-057 Conversion of Hanford Tails (UO_3) in Plant 4.
6/17/70	2 percent U^{235} Campaign	Letter: W. Adams to Distribution, Refinery Scheduling Meeting Date
12/14/70	2.0 percent U_{235} Campaign	Letter: J.E. Beckelheimer to W.J. Adams, Refinery Scheduling Meeting Date Dec. 14, 1970
12/23/70 thru 2/11/71	Hallam Fuel Elements	Production Order W-001 and W-003
1/18/71 thru 12/17/73	Prepare available equipment, e.g. Rodney Hunt Evaporator and Bartlett-Snow-Pacific 6 inch Calciner for a test denitration operation	Production Order W-005, W-005 Revision 1, and W-005 Revision 2. Denitration of Enriched UNH >2.0 percent <10 percent U^{235}.
2/17/71	Prepare and ship cascade feed from enriched uranium on inventory	Production Order W-004, Preparation and Shipment of Cascade Feed.
8/31/71	Prepare and Ship Approximately 98 kg of 10 percent Enriched Uranium To Y-12	Production Order H-080 10 percent Enriched Uranium to Y-12
1/21/72	Receiving, Weighing, Sampling, and Assaying Off-Site Commercial Returns.	Production Order A-902 Rev. 7.
1/27/72	Separate approximately 4500 pounds uranium as UF_4 (average U^{235} assay 2.5 percent) from paraffin matrix	Production Order W-006 Processing of UF_4 Paraffin Blocks.
3/9/72	Nuclear Materials Production Activities for 1971.	Oak Ridge Operations Plan 1971 through 1978.
4/11/72	Refinery 2.0 percent U^{235}, UO_3 Campaign.	Letter: M.S. Nelson to C.L. Karl
4/24/72	Refining 2.0 percent U^{235} Campaign.	Letter: M.S. Nelson to C.L. Karl
5/19/72	2.0 percent U^{235} Campaign-Refinery.	F.W. Neblett to S.F. Audia

TABLE E.1-1 (Continued)

Date	Explanation	Reference
8/2/72	Produce 1000 Mark 15 Inner and 1000 Outer Fuel Cores and ship to Savannah River	Production Order H-091 and H-092, Mark 15 Inner and Outer Fuel Cores-1.10 percent U^{235} Enriched.
1/17/73	Transfer Of Tower Ash from ORGP to NLO.	Letter: C.A. Keller
7/31/73	Formation of AEC-Wide Coordinating Committee For Plutonium and Transuranium Activities.	Letter: Charles A Keller to Gentleman
1/8/75	Nuclear Fuel Services (NFS) Uranyl Nitrate	Letter: H. Doran Fletcher to Gentlemen, Utilization of Recycle Uranium from Spent Power Reactor Fuel.
1/23/75	NFS Uranyl Nitrate	Letter: M.S Nelson to Doran Fletcher, Utilization of Recycle Uranium from Spent Power Reactor Fuel.
8/16/75	Processing of Low Enriched Uranyl Nitrate Solutions. Specification of 3000 d/m/gU.	Letter: H. Doran Fletcher Processing of Low Enriched Uranyl Nitrate Solutions
10/21/75	Transuranic level in Paducah Scrap to be processed at the FMPC. Feed Plant Ash – Np 0.89 ppm, Pu 35.2 ppb Vacuum Dust – Np 0.33 ppm, Pu 21.1 ppb	Letter: C.C. Hopkins, Plant Manager, Paducah Gaseous Diffusion Plant to C.R. Chapman Plant Manager FMPC
11/11/75	Transuranics migration into MgF_2 at Reduction ~80 percent of Pu/Np goes to raffinate during extraction	Report: NLCO-1130 Special Environmental Assessment of the Processing of Reactor Recycle Materials Containing Transuranium Elements.
2/13/76	1500 d/m/g Alpha Specification.	C.D. Tabor to Gentlemen Handling Of Low-Enriched Nitrate Solutions from Savannah River.
3/23/76	Alpha Specification 3000 d/m/g	Letter: C.D. Tabor to Gentlemen Handling Of Low-Enriched Nitrate Solutions from Savannah River.
3/29/76	Residues from Paducah that are to be processed for uranium recovery at NLO. Outlines material to be shipped to FMPC 2600 to 3000 drums.	D.C. Bonfer and F.W. Neblett to C.E. Polson and W.J. Adams, Trip Report-Union Carbide Corp.-Paducah Plant, Paducah, KY, March 23, 1976.
3/30/76	Package and ship enriched uranium oxide. (Evaporator-Calciner Product)	Production Order D-582 Enriched (4.5 percent U^{235}) Oxide For Rockwell International
4/6/76	Alpha Analyses by May 1,1976 At NLO	Letter: S.F. Audia to Doran Fletcher, Handling of Low-Enriched Nitrate Solutions From Savannah River
4/12/76	Reference to 12 percent Pu-240 instead of 6 percent	Letter: H.D. Fletcher to S.F. Audia Materials Management Appraisal Report

TABLE E.1-1 (Continued)

Date	Explanation	Reference
4/23/76	1500 d/m/g Alpha Specification	Letter: H. Doran Fletcher to W.D. Sandberg. Specification for Low-Enriched Uranyl Nitrate Solution.
5/4/76	Alpha Count for Pu and Np do not exceed 3000 – d/m/g	Letter: D.A. Tippenhauer to C.E. Polson, Trip Report-duPont - Savannah River Plant, April 22, 1976
5/14/76	Paducah Scraps	Letter: J.H. Cavendish to J.F. Schiltz, Development of A Time Chart for the Processing of the Paducah Scraps.
5/30/76	Treatment of Paducah Scraps in Plant 8 and Digestion in Refinery	Production Technology Department Highlights For The Month of May, 1976
6/30/76	Treatment of Paducah Scraps In Plant 8 And Digestion in Refinery Incinerator Ash, Pu= 7500 d/m/gU, Np= 2700 d/m/gU	Production Technology Department Highlights for the Month of June, 1976
7/31/76	Screened Paducah Incinerator Ash.	Production Technology Highlights for the Month of July, 1976
8/27/76	Technetium-99 in Paducah UNH.	M.W. Boback, Contact Report with H.W. Hibbetts.
8/31/76	Paducah UNH Pu=2.8 x 10^4 d/m/gU, Np=2.4 x 10^4 d/m/gU, Tc=1.5 x 10^6 d/m/gU	Production Technology Department Highlights for The Month of August, 1976
9/10/76	Onsite Pu believed higher than thought	Letter: H.D. Fletcher to S.F. Audia Materials Management Appraisal Follow-Up
9/30/76	Milling of Sodium Fluoride From Paducah.	Production Technology Department Highlights for The Month of September, 1976
10/31/76	Paducah Scrap UNH Shipments.	Production Technology Department Highlights for The Month of October, 1976
11/4/76	Inventory of Irradiated Materials.	Letter: C.C. Hopkins to Gentlemen, November 4,1976
11/30/76	Truckload of Paducah Scraps, See Report.	Production Technology Department Highlights For The Month of November, 1976
12/31/76	Sampling Paducah Scrap.	Production Technology Department Highlights For The Month of December, 1976
1977	Total Alpha Count For Pu and Np-2088 d/m/gm U For UNH From SRP.	Quality Control Department Bi-Monthly Report for October-November, 1977

TABLE E.1-1 (Continued)

Date	Explanation	Reference
1/19/77	Operate the 2 inch Extraction System to equal to or less than 5.0 percent U^{235} Uranyl Nitrate	Production Order W-007 Operation of Pilot Plant 2 inch Extraction Columns
1/26/77	Processing Paducah Scraps in Refinery. See report for TRANSURANIC Data	Completion Report, PTA-302 Refinery Processing of Paducah Scrap Materials
3/15/77	The Normal Concentrate and Paducah Scrap Campaign was Completed in Feb.	Production Technology Department Highlights for the Month of February, 1977
6/22/77	FMPC Refinery Activity.	Letter: S.F. Audia to H. Doran Fletcher, FMPC Refinery Activity-Normal Uranium November, 1953 Through March, 1977.
12/9/77	Refinery Activity, June, 1964 through 1977 Including chronology of production	Letter: S.F. Audia to H. Doran Fletcher, FMPC Refinery Activity-Enriched Uranium-June, 1964 (Startup) Through August, 1977
1/3/78	Recovery of Uranium from Paducah Scraps without using concentrates	Letter: D.C. Bonfer to J.H. Cavendish, Paducah Scrap Residues-Interim Report.
2/20/80	Paducah Feed Plant Ash Pu Results	Contact Report: B. Gessiness to Ed Kohler, Transuranics Content of Paducah Feed Plant Ash.
10/28/86	Raffinate Containing More Than 10 ppb	Letter: R.M. Spenceley to Mr. Reafsnyder, Drumming of Dried Raffinate Material Containing More Than 10 ppb Plutonium in the Greenhouse.
10/6/87	Paducah Scrap	WMT No. 2537 Rev. 1 Authorization to Ship Nuclear Materials.